countries, except probably at points where the distance presents apparently insuperable difficulties. The lower chalk or chalk marl affords a comparatively impermeable deposit, also of sufficient dimensions: but from its having a calcareous base, and from the possibility of fissures, with the absence of a protecting overlie, it has great uncertainty. In the gault there is another impermeable stratum, but of dimensions too small. The lower greensand contains no beds sufficiently continuous and impermeable. The Weald clay ranges about half-way across the channel; and if a belt of it should possibly pass round at the north end of the Varne and range to Wissant, it might prove to be worth further inquiries. In the Kimmeridge clay there is again a deposit of sufficient dimensions, but with a subordinate band which may be sufficiently permeable to present difficulties, whilst, though it comes to the surface on the French coast, its depth on the English coast must be very considerable. There is, however, just a chance that the Kimmeridge clay may in mid-channel be overlapped unconformably, and at a slight angle, by the Weald clay, and in that case they might for all purposes be considered as continuous strata. The Oxford clay presents similar difficulties, in addition to its greater depth and inaccessibility. In the secondary strata the irregular lie of the strata, and the presence of faults, are contingencies important to be considered.

"On the other hand, the great mass of the Palæozoic rocks so protected by impermeable overlying strata, is of such great dimensions, and so compact, and holds its range so independently of the more irregular range of the secondary strata, that it offers the conditions most favourable for the secure construction of a submarine tunnel; and that such strata can be worked in safety and for considerable distances under great bodies of water, has been proved at Whitehaven and Mons. But, on the other hand, the depths of these old rocks below the surface is very great, and they are much more dense and harder than the overlying formations.

"There is another important problem in connection with the Palæozoic rocks which such an undertaking might help to solve. The great question of the range of the coal measures under the south of England has lately come prominently into notice; and it was, in fact, in inquiries connected with that question that the foregoing considerations presented themselves to the author. The rich coal basin of Mons and the north of France has been traced to within thirty miles of Calais, where it thins out; but, like the coal basins of Liege, Aix, and Westphalia, which form separate sections of the same great trough, to the eastward, so there is reason to suppose that other sections of the trough set in on the westward, forming other coal basins, which possibly range to the west of England (Somersetshire), passing under the north-eastern part of Kent and the Thames. Any such work, therefore, as a submarine tunnel in these Palæozoic rocks could not fail to throw much light on the subject; while, in case it were to hit upon the line of strike of the coal measures, and could be carried on along that line, the work might prove otherwise remunerative, and tend to solve the great problem which interests so largely both geologists and the general public.

"Such, briefly, are the conditions which bear on the construction of a submarine tunnel between France and England. The author is satisfied that, considered on geological grounds alone, it is in one case perfectly practicable, and in one or two others it is possibly so; but there are other considerations besides those of a geological nature, and whether or not they admit of so favourable a solution is questionable. In any case the author would suggest that, the one favourable solution admitted, it may be desirable, in a question involving so many and such great interests, not to accept an adverse verdict without giving all those other considerations the attention and deliberation which the importance of the subject deserves.

"Under any circumstances, the difficulties are formidable. Whether or not they are insuperable are questions which may safely be left to Civil Engineers. The many and great obstacles overcome by engineering science in late years lead the author to expect that, should the occasion arise, and the attempt be considered worth the cost, the ability to carry it out would not be wanting. Various preliminary trials are, however, indispensable, in order to clear up some of the geological questions before a balance of the comparative advantages presented by the different formations could be satisfactorily settled, and before the grounds for action could be accepted."

From this it will be seen that the possibility of a Channel Tunnel remains now only with the engineers to decide. Geology has told them all the natural conditions under which they will have to work, so far as these can be known without actually tunnelling; and since so cautious a reasoner as Mr. Prestwich thinks it possible to carry out the scheme from a geological point of view, we should think that if it could be proved that the undertaking would pay, our engineers would be eager to show that the resources of their art are quite equal to its successful accomplishment.

OWENS COLLEGE "ESSAYS AND ADDRESSES"

Essays and Addresses. By Professors and Lecturers of the Owens College, Manchester. (London: Macmillan and Co., 1874.)

THIS book is due to the natural desire of the teaching staff of the Owens College to have some memorial of an event of the first importance in their own history, and to give expression to the hopes that animate the institution. The Owens College was founded by a single legacy a quarter of a century ago—for the creation of a college in which Lancashire lads might study at home the "branches of learning commonly taught in the English Universities." It first became known in connection with its first Principal, Scott, a writer who has left nothing which explains the high rank he held among his contemporaries and especially the influence he unquestionably exercised over every young man with whom he was brought into contact. Under him, however, the College did not flourish—the number of the day students sank at one time as low as 25—and it was only after the appointment of the present Principal, Dr. Greenwood, that it began to take root in Manchester. It has now about 350 day students—not including the medical students, who have been added only this session—and nearly 800 evening students. Curiously enough, what happened in Glasgow to the disappointment of many of the well-wishers of the University, happened also in Manchester. When the new buildings, with all their increased convenience for study, were opened, it seemed natural to anticipate a great increase of students. Nothing of the kind took place. Students seem to come and go to college because they want to be taught, not because they are to have beautiful buildings to be taught in. The effect will certainly be considerable, alike on teachers and on taught, of the more commodious buildings recently erected in Glasgow and in Manchester, and it will be felt more and more as time goes on. The fact that it is not felt at first shows, however, that the wants that are satisfied by university teaching lie so deep down that an external event like the inauguration of new buildings scarcely influences them.

The success which the Owens College has thus attained in a quarter of a century is due to much hard work—to careful and deliberate adaptation not merely to the wants of the time, but to the claims of real culture—and above all of course to the fact, which that success proves, that in Lancashire, or that portion of it of which Manchester is the capital, there is a real demand that the higher education may be brought home even to the doors. This book serves as a record of much of the work done—and an expression of the ideas of the teachers whose spirit has made and still makes the Owens College. No one who glances at the titles of the fourteen essays and addresses of which it consists can fail to be struck with the variety of the teaching. It accomplishes the task laid upon it by its founder, by teaching nearly everything commonly taught in the English Universities. We find two Professors of Classics, one of Oriental Languages and one of Modern Languages, two of Natural Philosophy, a Professor of Natural History, and a teacher of Geology, a Professor of Chemistry, a Professor of Engineering, a Professor of Jurisprudence and Law, a Professor of Physiology, and two gentlemen who seem to be three or four Professors rolled into one, the accomplished incumbents of the chairs of "English and History," and of "Logic, and Mental and Moral Philosophy, and Political Economy." Besides these, there are at least half a dozen more, the Professors of Mathematics, the Professors of three or four Medical subjects, the additional lecturers on Law, on Organic Chemistry, and so on, who put in no appearance in the volume. The College is in fact equipped with a staff of teachers which bears favourable comparison with that which is usually found in older Universities. The Medical department has been added only this session; the Law and Jurisprudence department has recently made a considerable step in advance. Except that several of its members are evidently overburdened with subjects too large for any single man, the staff of the College is reasonably complete, and most things can be learned in it which are taught elsewhere.

We turn with interest to the volume before us to discover, in the choice of their subjects and in the manner of treating them, the aims and tendencies of the professors and lecturers. What is most noticeable, and it cannot fail to strike even the casual reader, is the caution, the moderation, we had almost said the conservatism which is characteristic of most of them. People are still tempted to associate the name of Manchester with everything that is "advanced," and we look in such a book as this for a daring championship of educational and scientific novelties. From the first words of the President's opening address to the last words of the essay which closes it, the tone of responsible thoughtfulness, of the wish to be just and true more than to be vigorous or startling, is never to be mistaken. The Duke of Devonshire the President, and Dr. Greenwood the Principal, unite in urging that the older class studies—those connected with literature—should not be pushed aside and comparatively disregarded, and that the newer studies should be taken up in their full depth and breadth, not in a fragmentary or superficial manner or with any supposed reference to their immediate application. These cautions are supplemented, indeed, but they are not contradicted, by Prof. Roscoe and Balfour Stewart, who urge, the one that original research is a powerful means of education, and that original research should be organised, as it has already been to some extent, especially in his own department; the other that we should set about great national studies, establishing a watch, for instance, on the sun, "a creator of disturbances on the greatest possible scale, who is ever ready to afford us information about himself at the smallest possible cost." Mr. Reynolds follows them with a demand for a national commission to experiment on heat engines, and the conditions under which they could be practically worked, economically, or efficiently, or both, to higher pressures than we now attempt to use, so as to get more work out of our coal and our machinery, and perhaps some day to enable a light-weight jockey to fly at the rate of 200 miles an hour. After these speculations and demands, which are certainly significant of the modern age, follows Prof. W. C. Williamson's cautious and copious discussion of the theories of natural selection and evolution, as tested by primeval vegetation. We call it a conservative paper because the conclusion of the writer is that among the innumerable facts known and co-ordinated about the primeval vegetation, there is little sign that the laws of natural selection and evolution have operated to a large extent in transforming the vegetable species of the pre-carboniferous strata to those with which we are now familiar. But Prof. Williamson is absolutely frank in his admission of the new laws, and singularly candid in accepting any explanations which they seem to offer. He admits "that by the help of natural selection man has brought into existence many new varieties of pre-existing plants and animals, most, if not all of which, were his protecting hand withdrawn, would soon revert to their primal forms. We have no evidence that unaided nature has produced a single new *type* during the Historic period. We can only conclude that the wonderful outburst of genetic activity which characterised the Tertiary age was due to some unknown factor, which then operated with an energy to which the earth was a stranger, both previously and subsequently." It is in a bolder spirit that Prof. Bryce speaks of the new Judicature Act, a measure which throws us back in principles and in practice many centuries, and which is, in his view, "a reform in English law greater in some points of view than we have had since English law itself began to exist." The note of conservative caution returns on our ears in the two last essays on the Relation of the Railways to the State, by Prof. Jevons, and on the Peace of Europe, by Prof. Ward. The conclusion of the former is emphatic, and altogether hostile to the movement party who advocate the State purchase of our railway system. There are few questions deserving to be more seriously studied by politicians or likely to need more serious study, for in the changes and chances which affect our governments, some new men may some day drift with us into schemes which would be in themselves imprudent, and which would be foolish except by way of preface to a more comprehensive measure. We could not take the railways over, Prof. Jevons thinks, for less than a thousand million sterling, which is about double their commercial value. The attempt might be all but ruinous to the nation, and the results would be altogether disappointing. But among the middle and upper classes, who own the railways, there is certain to be a considerable feeling in favour of a scheme which would be fruitful of so much pecuniary benefit to themselves, [and it is well to have it discussed beforehand as thoroughly and as thoughtfully as it is discussed here. It is in useful conservatisms such as these that Universities often do their greatest services. They are mints at which the coinage that is passing current in the commoner exchanges of the world may be thoroughly tested. Prof. Jevons offers statesmen and politicians an admirable discussion, luminous with the most practical good sense. Like his colleagues, Prof. Ward is conservative in the sympathies of his essay. We have been engaged for many years in breaking down the venerable theory of the Balance of Power in Europe, and we have been attempting to build up in its stead a sort of Temple of Doctrinairism—sacred to a goddess of international arbitration, who is to be capable of the cure of all international ailments. Prof. Ward applies the touchstone of his comprehensive historical knowledge to both. He is utterly hostile to the doctrine of Spinoza that, as the natural state of man is a state of war, no nation is bound to observe a treaty longer than the interest or danger that caused it continues. But the old treaty basis of the peace of Europe having broken down, "the remedy for the danger accruing with new force to the peace of Europe is to be sought, not in an abandonment of the principle of joint action, but in an enlargement and elevation of it, and in the progress of that enlightenment which, instead of enfeebling, strengthens the common action of men and of states. For it is with nations as with individuals. The cultivated, and by culture enlightened, mind is and must be on the side of progress and peace against that of darkness and conflict. The obscure men, like the unformed nationalities, are at once materials and causes of that which disturbs, unsettles, and retards personal and national and international life. Where the education, and more especially the higher education, of a country is fostered, there lie the best promises of progress and of peace."

We do not attempt any detailed criticisms of the several essays. The subjects chosen by fourteen professors on which to address the world are likely to be reasonably well chosen, and the addresses delivered on them are pretty sure to reward the attention of the reader. They strike us as very well chosen; they sufficiently represent the real variety of teaching and of manner of teaching in the institution; they contain complete and occasionally brilliant discussions of subjects of very considerable general interest. They are the expressions of the inner spirit of a seat of learning in which science holds a higher place than she has usually done, but in which there is the most emphatic and continual protest against the degradation or neglect either of literature or of science. They show a body of teachers full of modern life, and at the same time singularly moderate, truthful, and reverent. Several of the essays are historical studies, and in these cases the reputation of the writer is a sufficient guarantee of completeness. In their collected form the "Essays and Addresses" warrant high hopes of the future of the Owens College. In a sense—perhaps a somewhat too literal sense—it is what it was once called in a journalistic epigram, the University of the Busy. With its present staff it will certainly continue the tradition which connects the older Universities with the highest learning of the time.

W. J.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Sir John Herschel's Letters

IT is known to many through the numerous applications I have made, that a collection of the letters of Sir John Herschel is in progress. For the many and valuable contributions, as well as for the kind and sympathetic expressions which I have been favoured with, I cannot be too ready to express once more my sincere acknowledgment; and when I recall these to mind I hesitate to take any less private step to further the end in view, or, by venturing on a public appeal, to forego the advantage of more direct communication. Several considerations however—which not even your courtesy in allowing this letter to appear in the columns of NATURE would justify me in dwelling upon—forbid me to depend solely on the activity of a single importunate pen. The correspondence in question covers more than half a century. Many of the correspondents were of a former generation, and their present representatives are known to but few. I may instance the names of Davy, Young, Wollaston, —not to mention many continental savans—in illustration of this. Many others, less eminent, but not the less recipients of letters which the student of scientific history will prize as containing the germs of much of the force whose impetus we now feel, were hardly known by name beyond their own immediate circles. Many more, as I would fain believe, who either themselves corresponded with my father, or knew him in his letters to their relations, are even now in possession of such letters, and may not be unwilling to let them be seen. Lastly, I hear too much of autograph collectors not to feel a keen desire to make their instant acquaintance. Have they not devoted themselves to preserving individual letters, no matter how trifling, from the fate which has—alas too often—overtaken others, no matter how numerous, or how valuable!

In my applications hitherto I have been constrained to repress the expectation of immediate publication. I am not at liberty to depart from that now. But that the materials which I may now be permitted to store up *will* eventually help to form the foundation of such a monument as may be fitting—this requires no student of history to tell us. That it may be amply provided for now, before it is too late, is my chief anxiety. For my time is limited, and I have drawn too many blanks not to feel that every year increases their number, let who will take my place.

I apologise for so long a story, and will only add in the most general terms that I appeal to all who possess, or know of the existence of, autograph letters of Sir John Herschel—no matter how insignificant they may seem, for collation with others can alone supply a true test—but of course with due regard to personal consideration—to communicate with me at once. It is hardly necessary to say that all autograph letters will be returned, and that any restrictions will be attended to.

21, Sumner Place, Brompton, S.W. J. HERSCHEL

Coggia's Comet

YOUR readers may be interested to learn that the light of the comet is by no means strongly polarised. On the 2nd and 4th instant I examined it with a double-image prism, but could not with certainty detect any difference between the brightness of the two images. I also examined it with a plate of right- and left-handed quartz in the principal focus of the 4-inch telescope and a Nicol's prism packed among the lenses of the eyepiece, but could not detect any traces of colour. With a Savant placed between the eyepiece and the eye no bands were detectable. But on the 6th, about midnight, when the comet was shining very brightly, I could perceive a difference in the brightness of the two images with the double-image prism, indicating polarisation *in* the plane passing through the sun's estimated place. But I was still unable to detect any traces of polarisation either with a Savant or Biquartz, or with a plate cut from a natural crystal of right- and left-handed quartz giving a band across the field in which the two crystals overlap; a form of polariscope which has been found on other occasions very delicate for faint lights.